

XAML Digital Representation of Embroidery Cross Stitch Symbols

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Abstract. This paper studies problems related to the development of craft software. It proposes an approach to developing an application for digital representation of stitches in cross stitch pattern software. The software is oriented to people manufacturing national Bulgarian costumes and clothing employing national Bulgarian cross stitch and embroidery. As UI elements, stitches are represented in XAML code. Graphic primitives are described in vector format; character transformations are allowed, and there are possibilities for creating combinations of stitches. The solution will be used in cross stitch software development.

Keywords: Cross stitch Software, CAD Systems, XAML, Home Crafts, Digitalization, Computer-aided Design.

1 Introduction

Over the centuries, traditional textile domestic handicrafts such as weaving, knitting, crochet, cross stitch and embroidery have become widely spread activities in many countries. Performing these traditional female activities has always aimed to produce cloths and different kinds of richly decorated homespun textiles. Many researchers define crafts as part of intangible cultural heritage, using a term “living heritage”. They underline that caring for cultural heritage might be seen as a shared moral responsibility of today’s society as a tribute to the past while aiming for the future. (Rosenqvist, 2016).

As part of cultural heritage, traditional textile crafts have always had important cultural and economic impact on people. It’s important to note that traditional textile is not only found in museum samples; it can be used as a basic concept for modern fashion collections. (Falk, 2016).

Traditional Bulgarian folk costumes are richly decorated with embroidery and crocheted lace, which being part of the artistic decoration, in addition to also have a protective function - the purpose is to protect human beings against malicious forces, magic, as well as to ensure health and prosperity (Veleva, 2018). In this way, each embroidery pattern has a certain symbolism involved, passed down through the centuries, and therefore, the preservation of old patterns is crucial to the preservation of the intangible cultural heritage.

In recent years, there has been a growing interest in Bulgarian folk costumes in this country. Many companies offer on the market production of both Bulgarian folk costumes and clothing, decorated with typical national embroidery (Vezba, n.d.); many people use Internet to share free patterns of Bulgarian embroidery and exchange different ideas related to textile handicrafts (Popova, 2016), (Alita Design, n.d.) (istoriavshevici, n.d.). That is why, it is important that there should be some pattern design software support these activities.

Craft software plays a significant role in assisting people who deal with textiles. So, it can be used for digital representation of old traditional patterns. Hence, it is very important that its functionality should be consistent with the peculiarities of craft techniques used one-time. This paper focuses on the digital presentation of different stitches in craft software. The results can be used for such kind of applications development.

2 Features of Bulgarian Embroidery and Cross Stitch Decoration

As already mentioned, embroidery and cross stitch are the most used techniques in national Bulgarian cloths decoration. It is necessary to underline that there exists some difference between Bulgarian and English terminology concerning these traditional textile crafts. According to the English speaking authors, most people confuse cross stitch for embroidery because it is essentially a type of embroidery work; however it requires counted needlework, which differentiates it from regular types of embroidery. The most commonly seen and practiced cross stitch is an X-shaped stitch on divided squares of a fabric that form a pattern when combined (Brown, 2022). The Bulgarian terms “*shevitca*” and “*vezba*” could be translated as *cross stitch*, but some techniques in traditional Bulgarian “*vezba*” can be referred more to embroidery techniques. For this reason, the terms *cross stitch* and *embroidery* are used simultaneously as the former is more frequently mentioned.

Since this paper deals with the digital representation of different types of stitches, special attention is paid to the cross stitch and embroidery techniques typical of the Bulgarian national style. The most frequently used stitches in Bulgarian needle work are: *full stitch* (or *cross*), *half stitch* (or *continental*), and *black stich* (see fig.1.). Regrettably, only these types’ stitches are involved in the existing cross stitch software; so the manufacture of the cross stitch patterns is limited to these techniques (Williams, 2022). The digital representation of cross stitch pattern in software is as colored squares or crosses placed in squared grid working area. Each square corresponds to a single stich (*full stitch* or *half stitch*). It is possible to make a *full stitch* or a *half stitch* in more than one square of canvas, called *stitching over 2*; *long arm half stitch*; however but the most cross stitch software applications don’t provide such functionality. Because *stitching over 2* and *long arm half stitch* as stitch types exist in Bulgarian patterns, they have to be included in the future cross stitch software project.

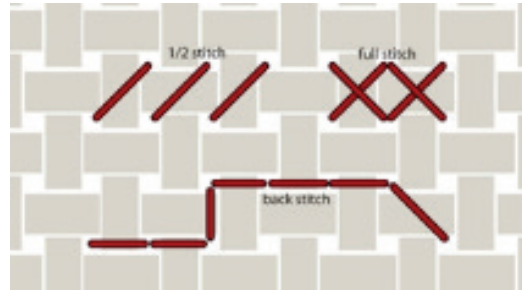


Fig. 1. Basic stitches – half stitch, full stitch, black stitch.

There are different types of a *half stitch* in traditional Bulgarian cross stitch. The basic *half stitch* could be made in two different ways distinguishable from the back side of the pattern. But there is a variation using a leading thread as it is shown in fig. 2. “*Tronski bod*”, typical of the Bulgarian Strandzha region is a type of *long arm half stitch* with a leading thread. These varieties include a set of half stitches incorporated in a single group or cluster treaded as a single common item (fig. 3).

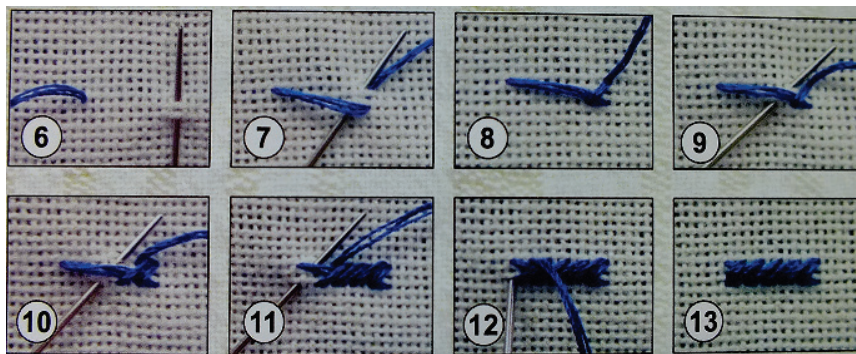


Fig. 2. Group of half stitches with leading thread.

Bulgarian embroidery technique includes also more complex stitches. Some of them can found in embroidery tradition of other peoples in cross stitch sites. Such types of stitches are: *herringbone stitch*, *satin stitch*, *chain stitch*, *Lazy Daisies*. Bulgarian patterns use a variety of *double cross stitch* (or *Smyrna stitch*) called *Bulgarian cross*. But there are some unique typical Bulgarian stitches, e.g. “*triagalen bod*” (*triangle stitch*), “*pravolineen*” (*straight-line stitch*), “*Samokovski X*” (*cross from the Samokov town*), etc. The already mentioned “*Tronski bod*” (fig. 3) also belongs to this group.

The paper addresses on the problem of how present different types of stitches in cross stitch software. It is important to mention that there are different types of techniques in cross stitching and embroidery in traditions of different nations that should covered by the craft software.

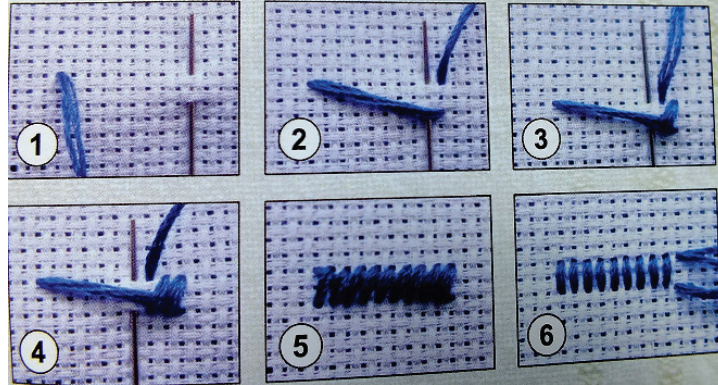


Fig. 3. Implementation of “Tronski bod”.

3 XAML Digital Representation of Cross Stitch Symbols

XAML, or Extensible Application Markup Language, is a declarative XML-based markup language. Applied to the .NET Core programming model, XAML simplifies the creation a user interface for a .NET Core applications. XAML directly represents the instantiation of objects in a specific set of backing types defined in assemblies. The XML-based language for digital representation for knitting and crochet symbol sets has already been done. The developed Portable Knitting Format contains the XML elements describing graphic primitives: line, polygon, polyline, arc, ellipse, rectangle, and Bezier curve (Zaharieva-Stoyanova & Bozov, 2015). Using all these primitives, the editor can describe all possible knitting or crochet symbols (Zaharieva-Stoyanova & Bozov, 2017).

Cross stitch symbols are semi graphical symbols represented as graphical shapes. To describe 2D shapes in XAML, the Shape and Geometry classes are used. Namespace Windows.System.Shapes includes types Ellipse, Line, Path, Polygon, Polyline for representation of different graphic shapes. It includes also base class Shape. Geometry objects are used to create a composite shapes and a Path element is applied to display them. The types LineGeometry, EllipseGeometry, RectangleReometry, BezierSegment, etc. represent different types of figures and combinations between them. The aim is how to describe stitches in cross stitch software development. Some examples of XAML description are given in this paper.

The following code gives half stitch and full stitch description:

```
<Path Stroke="Black" StrokeThickness="4" >
<Path.Data>
<!-- Creates a half stitch. -->
  <GeometryGroup FillRule="EvenOdd">
    <LineGeometry StartPoint="0,0" EndPoint="50,50" />
  </GeometryGroup>
</Path.Data>
</Path>
```

```

<Path Stroke="Black" StrokeThickness="4" >
  <Path.Data>
    <!-- Creates a full stitch. -->
    <GeometryGroup FillRule="EvenOdd">
      <LineGeometry StartPoint="0,0" EndPoint="50,50" />
      <LineGeometry StartPoint="50,0" EndPoint="0,50" />
    </GeometryGroup>
  </Path.Data>
</Path>

```

The following code gives a half stitch and a full stitch description:

```

<Path Stroke="Black" StrokeThickness="4" >
  <Path.Data>
    <!-- Creates half stitches with leading thread -->
    <GeometryGroup FillRule="EvenOdd">
      <LineGeometry StartPoint="0,50" EndPoint="250,0" />
      <LineGeometry StartPoint="0,0" EndPoint="50,50" />
      <LineGeometry StartPoint="0,50" EndPoint="100,50" />
      <LineGeometry StartPoint="100,0" EndPoint="150,50" />
      <LineGeometry StartPoint="150,0" EndPoint="200,50" />
      <LineGeometry StartPoint="200,0" EndPoint="250,50" />
    </GeometryGroup>
  </Path.Data>
</Path>

```

The results of XAML code is given on fig. 4.

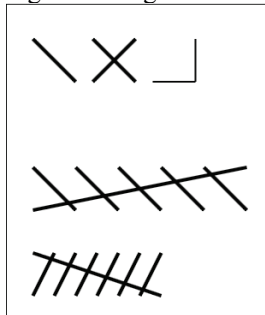


Fig. 4. XAML presentation of *half stitch*, *full stitch*, *two black stitches*, *half stitches with leading thread* and “*tronski bod*” stitches.

4 Conclusions

Although centuries-old, home crafts can also profit from the advantages and achievement of modern technologies. The people dealing with them apply software patterns or to create new ones. The craft software development has a significant role in protecting and preserving of cultural heritage. The paper treats the problems related to cross stitch

software development - digital representation of the patterns and particularly, the representation of different types of stitches. The work focuses on XAML stitches description. The future work will encompass cross stitch software development oriented to patterns of Bulgarian national costumes.

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